



Efficiency Through Standard Work

RMGPA Fall Conference
September 21, 2012

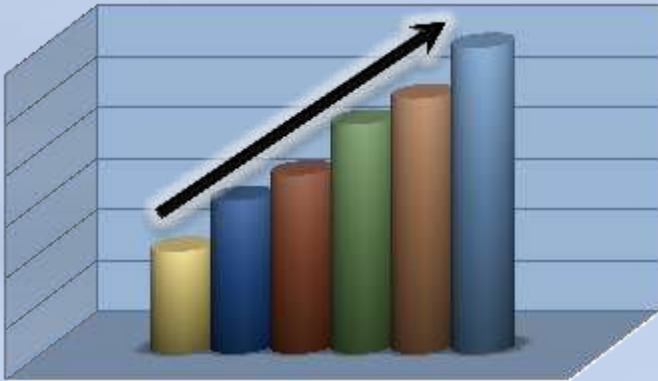
Are You Faced With ...?



Budget
Constraints



Hiring
Limitations

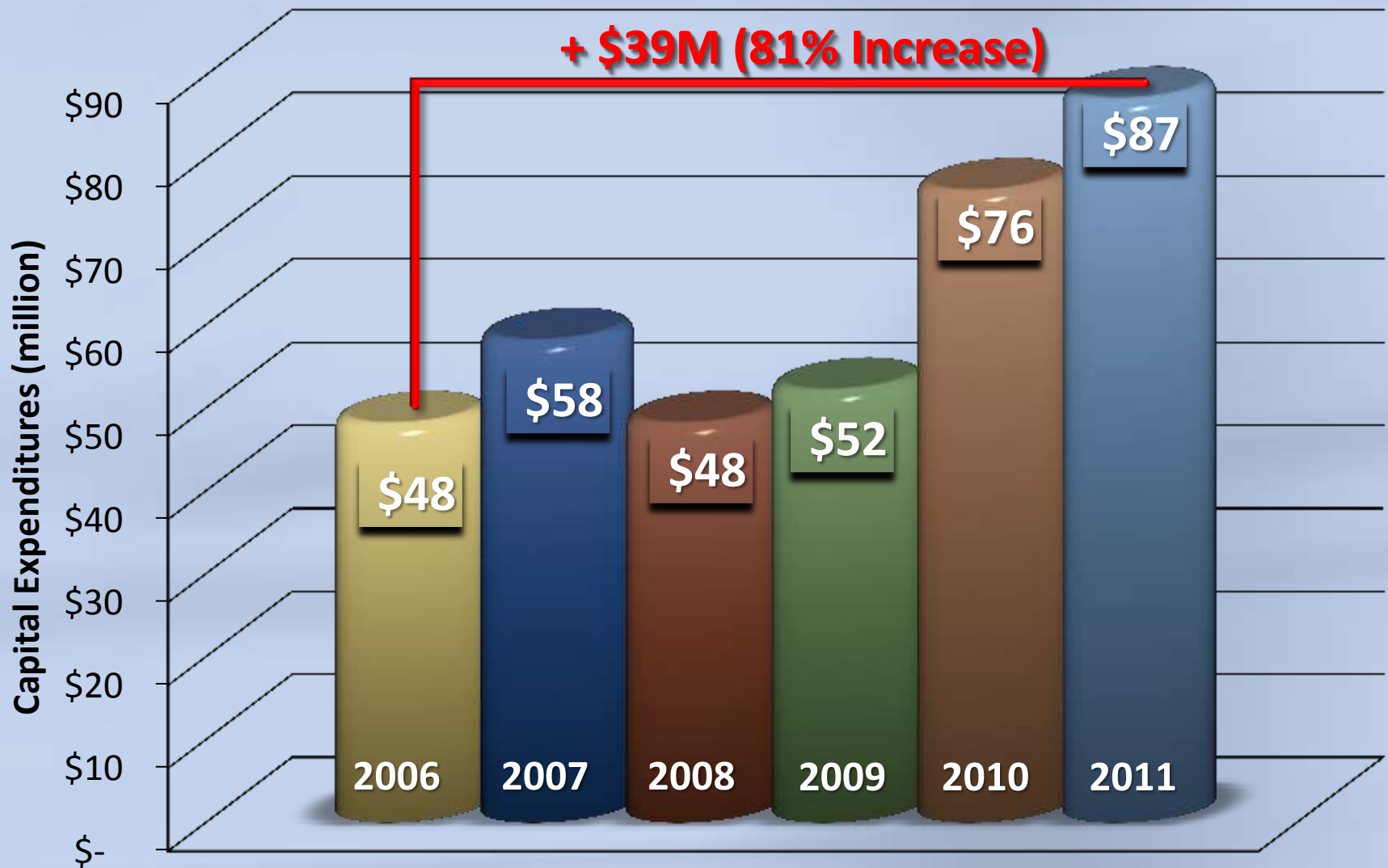


Increasing
Capital Needs

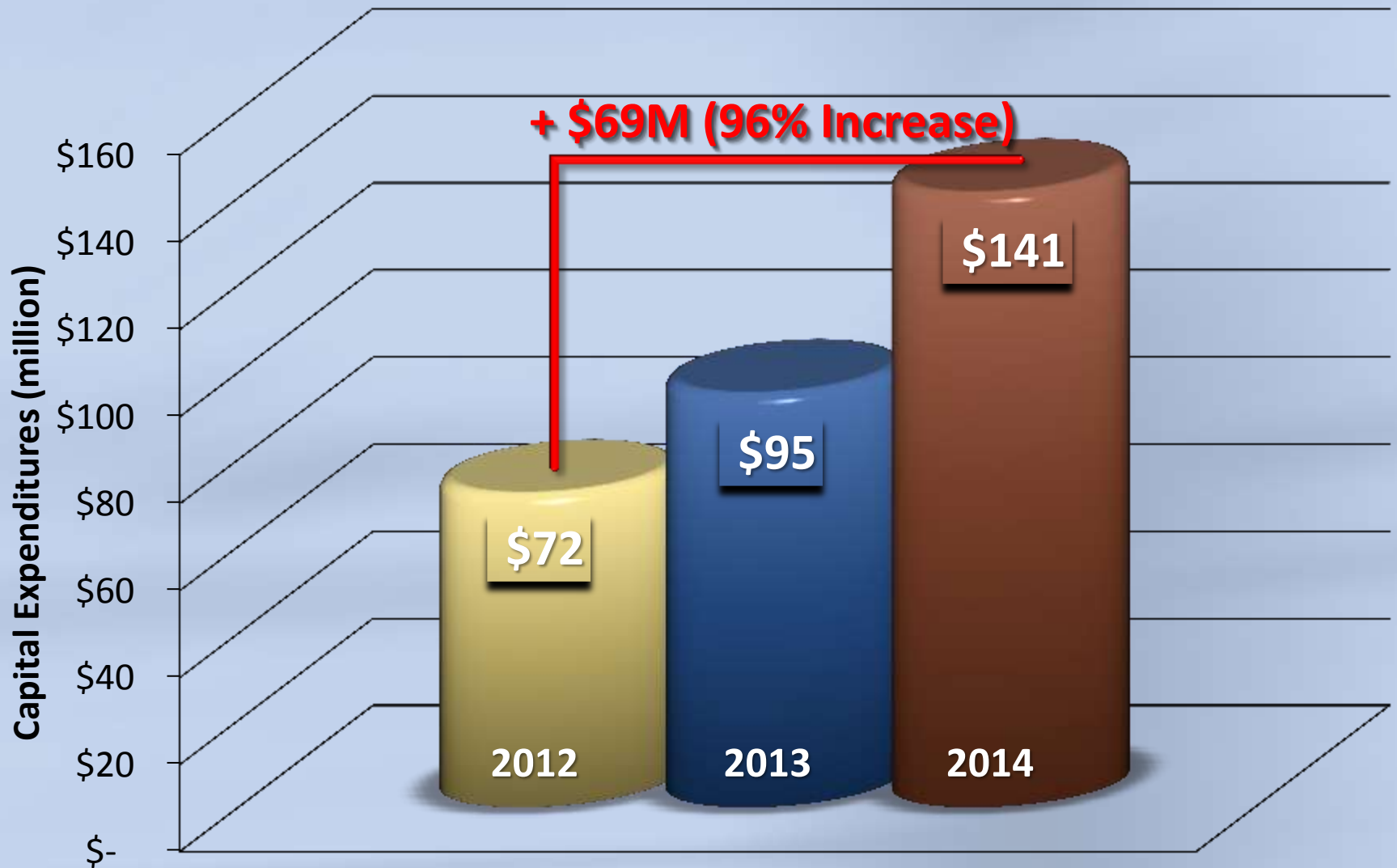


Circle of
Life

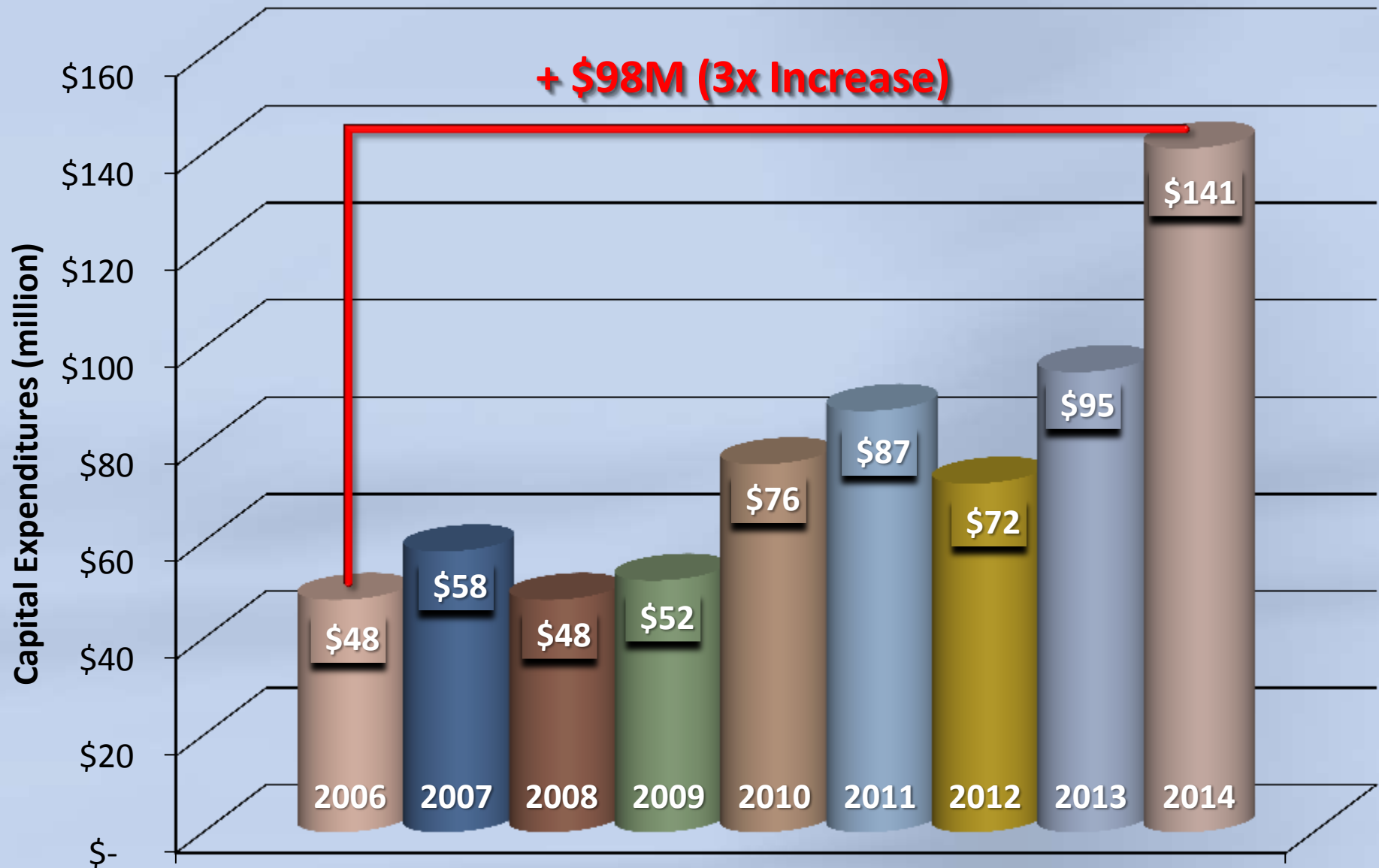
Background: Where We've Been



Where We're Going



Capital Expenditures: 8-Year Rise



2006 => Minimum Level of Efficiency



We needed to standardize our work!

Standard Work

*"The most effective combination
of manpower, materials and
machinery."*

*Continuous Improvement ➡ Kaizen
- Lean Process*

Efficiency Questions

1. Are you repeating redundant tasks?
2. Is contracting too involved and time consuming?
3. Do you have inefficient/confusing processes?
4. Do you have inefficiencies in field tasks?

Rules For Standard Work

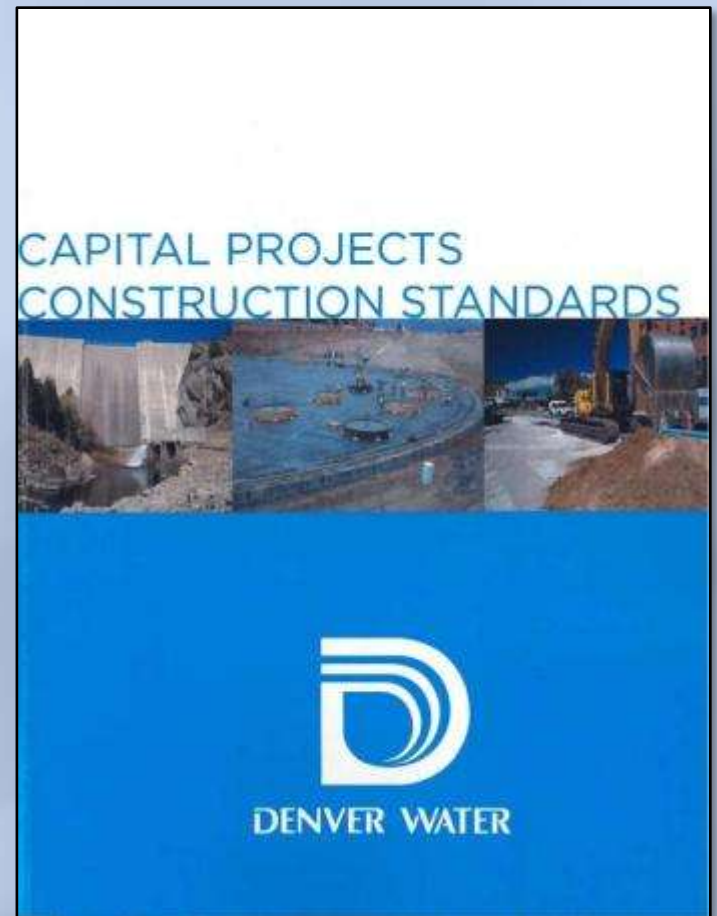
1. Eliminate redundant activities
2. Make contracting easier
3. Agree on and document processes, eliminate wasted steps, and educate
4. Carry efficiencies to the field

Rule 1: Eliminate Redundant Activities

Standard Work: Contract Documents

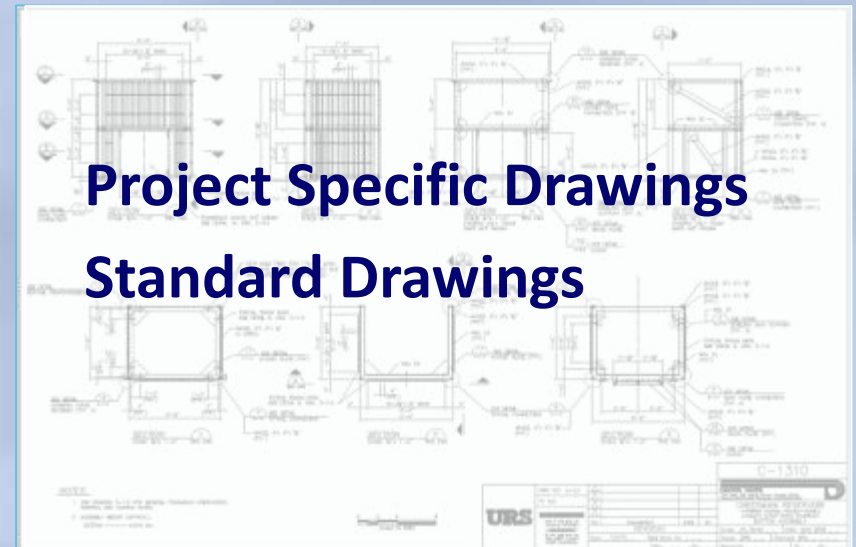
Capital Project
Construction
Standards (CPCS)

*A New Way of
Doing Business*

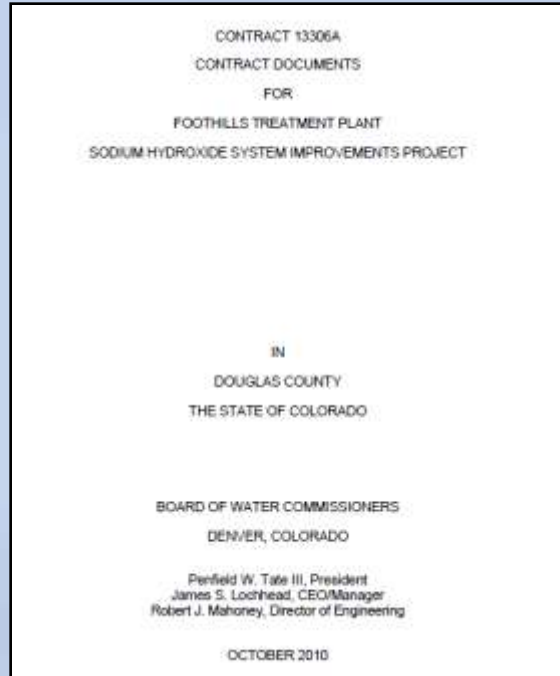


Previous Process

**Construction
Contract =
Documents**



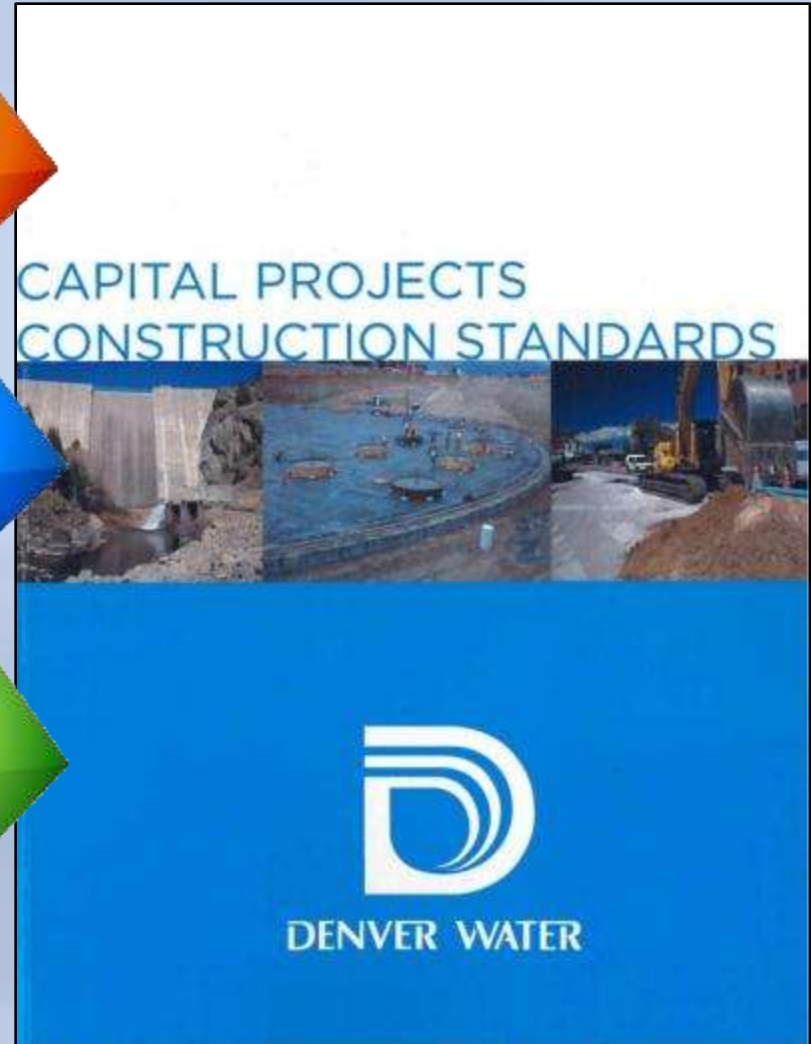
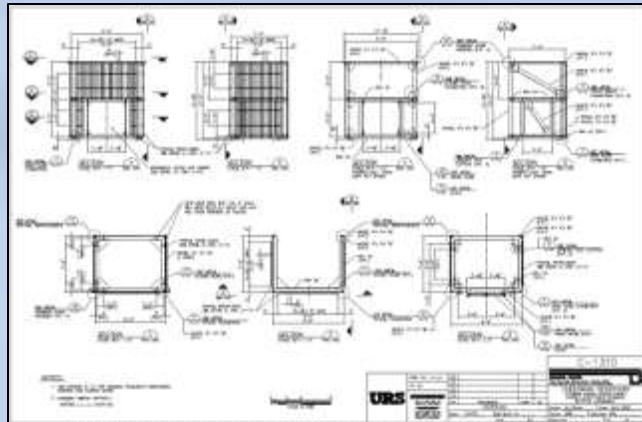
Capital Project Construction Standards



**GENERAL
CONDITIONS**

**STANDARD
SPECIFICATIONS**

**STANDARD
DETAILS**



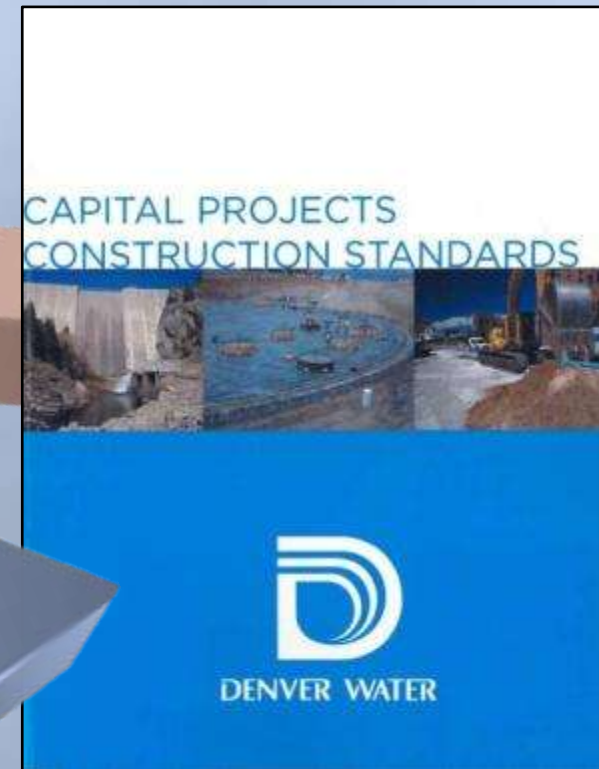
Effective Use of Standards



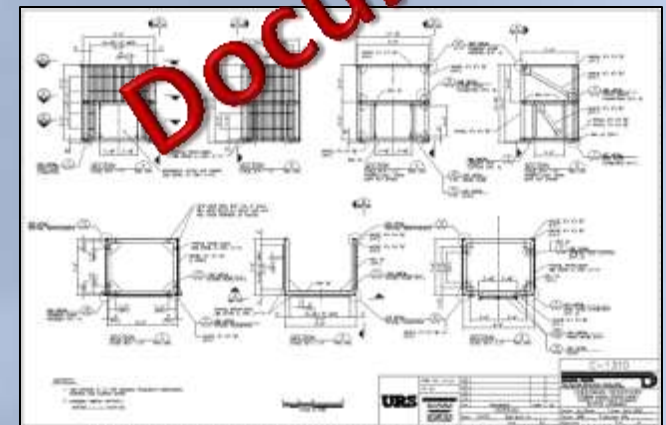
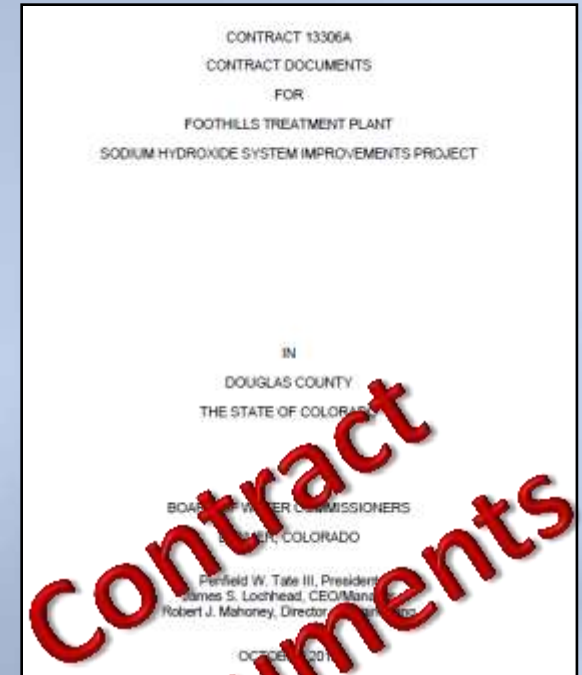
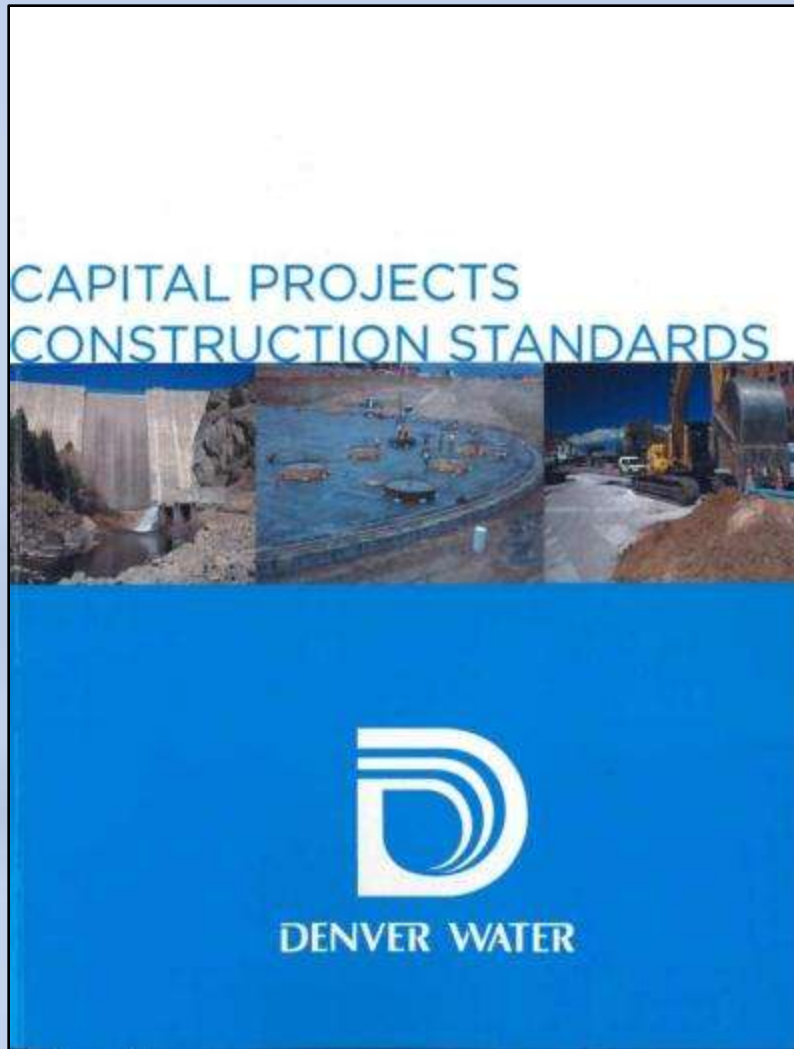
Use on Transmission &
Distribution Projects

CPCS may refer to
Engineering Standards

Use on Capital Projects



New Process – Project Contract Documents



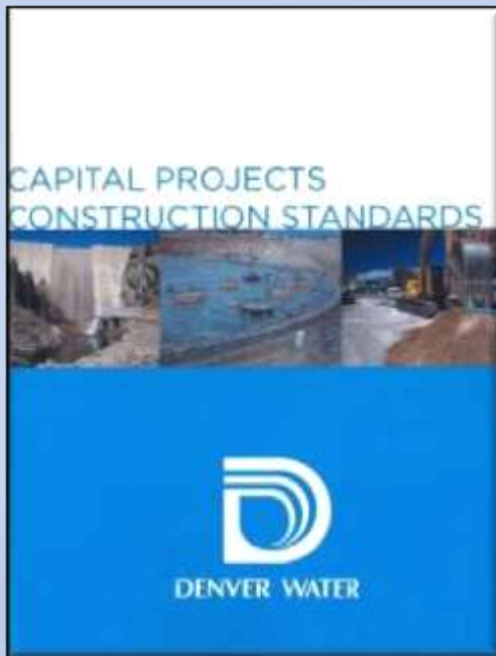
CPCS Registration Form

The screenshot shows the Denver Water website with the following elements:

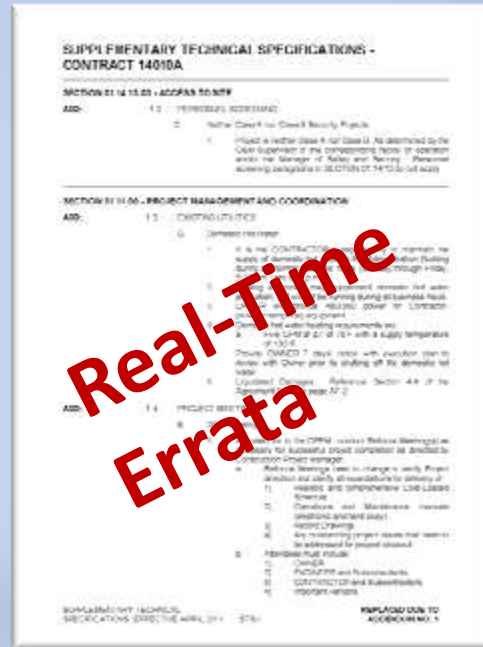
- Header:** DENVER WATER logo, navigation links (PAY BILL, CUSTOMER SUPPORT, CONTACT, EMERGENCIES, ESPAÑOL), and a user selection dropdown (I AM A: Residential Customer) with a search bar.
- Navigation Bar:** A row of orange buttons for various services: WATER SERVICE & SUPPORT, BILLING & RATES, CONSERVATION, WATER QUALITY, SUPPLY & PLANNING, RECREATION, CONSTRUCTION PROJECTS, EDUCATION & OUTREACH, and ABOUT US.
- Left Sidebar:** A menu titled "Doing Business with Us" containing links for Requests for Bids, Engineering Overview (highlighted), Purchasing Overview, Small Minority and Women Business Enterprise Program, GIS Maps and Data Requests, Restricted Access Area, Plan Reviews, Cross-Connection Control and Backflow Prevention Program, Operating Rules, Water Sales Forms, and Information Technology Contractor Positions.
- Main Content Area:**
 - Breadcrumbs:** Home > Doing Business with Us > Engineering Overview > Capital Projects Construction Standards
 - Section Header:** Capital Projects Construction Standards
 - Text:** Parties who download and print any portion of the *Capital Projects Construction Standards* are strongly recommended to complete the CPCS registration form to keep informed of any errata issued by Denver Water.
 - Links:** Complete Capital Projects Construction Standards (13.5 MB), Supplementary Technical Provisions, and Applicable CPCS Specification Sections.
 - Registration Form:** A section titled "Registration Form" with a note: "Fields marked with an * are required." It includes input fields for:
 - * Company Name
 - * Address
 - * City, State and Zip
 - * Phone
 - Website (if applicable)
 - * Contact #1 Name
 - * Contact #1 Email
- Right Sidebar:** A "Help" section with text: "On March 29, 2011, Denver Water held a meeting for consultants and contractors. For those who could not attend or for those who want a refresher please download presentation."

**Keep track of the
consultant database
through a
SharePoint list.**

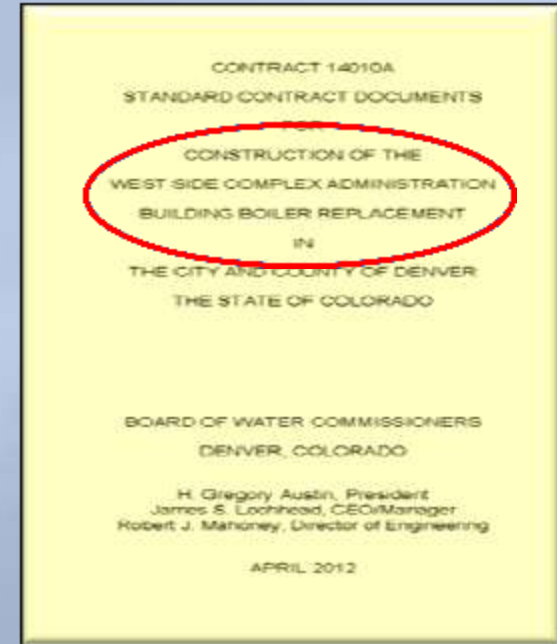
How will we use the CPCS in design?



Current



Supplemental Technical Specifications

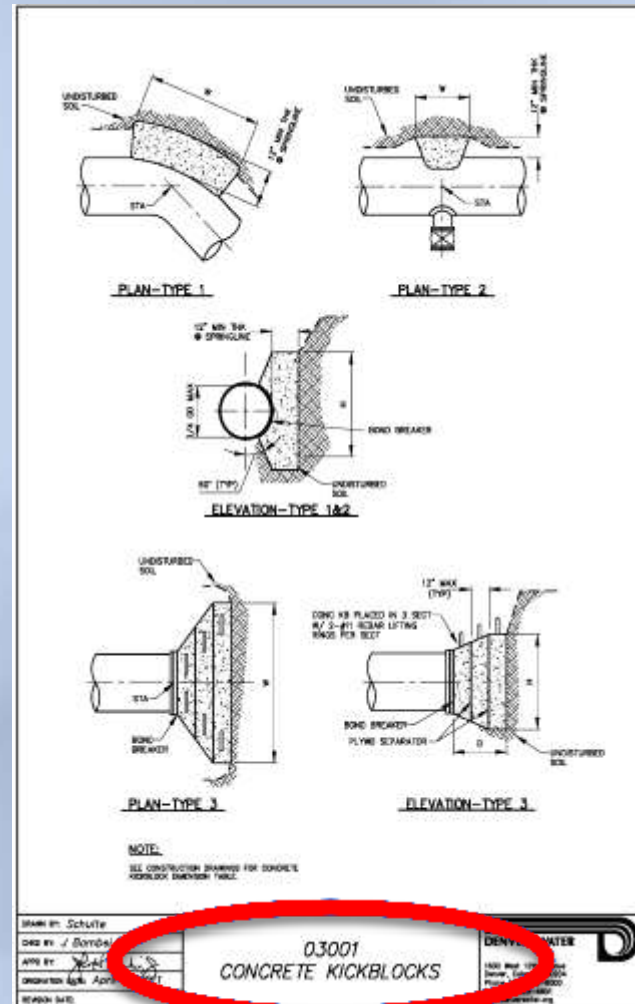
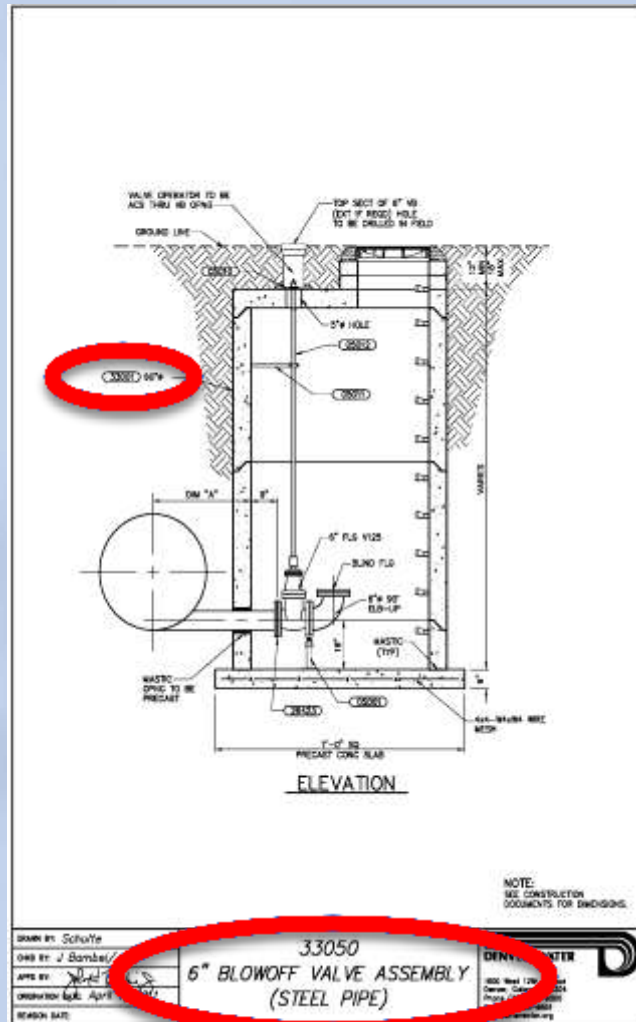


Project Specific Specs/Forms and Plans

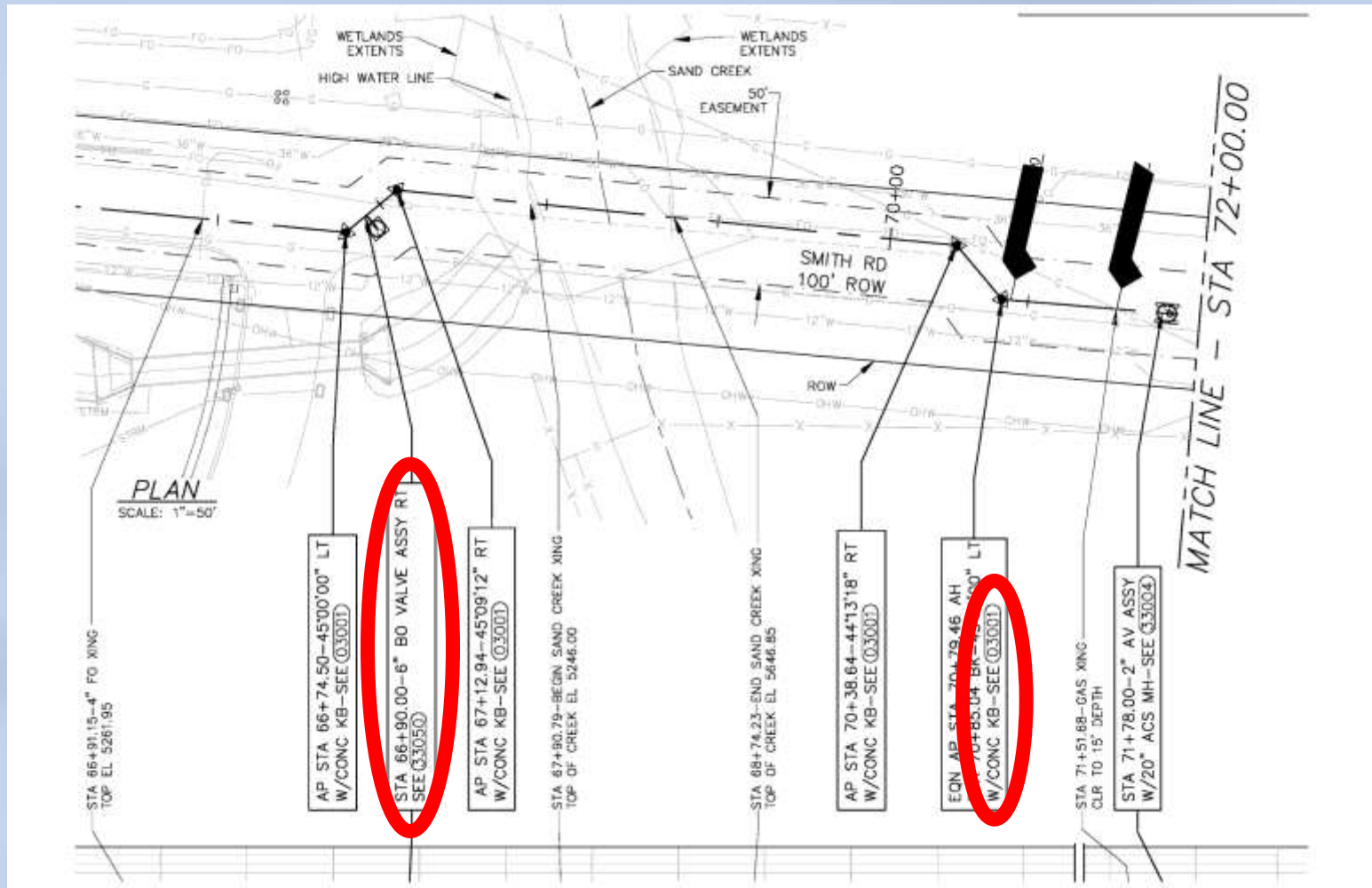


Contract Documents

How will we use the CPCS in design?



How will we use the CPCS in design?



2011 CPCS Fact Sheet

- Standard Specifications
 - 12 Division
 - 87 Specifications
- Standard Details
 - 11 Divisions
 - 269 Details
- 852 Pages

Who else uses similar standards for water system capital work?

Similar standards are used by many municipalities, highway departments and drainage districts

Denver Water is one of the first water utilities to utilize comprehensive, multi-discipline standards for Contract Documents



CPCS LOVES TREES

Paper Savings Since CPCS Inception



*Calculations based on average of 250 sheets/project x (5 review copies @ 60% & 90% + 45 bid copies) x 37 projects = 501,250
Projects include all awarded since April 2011 through May 2012.

Example CPCS Successes

- To date CPCS has saved **501,250** Sheets
- Annual Savings Goal: 500,000 Sheets
- 31% of Specifications are in the 1st Edition
- **37 Projects Bid** through 2011 in 6 Areas
- General Conditions standardized and held static
- Annual Vault Program saved **14 Plan Sheets**

Example Plan Sets!



2013 CPCS Fact Sheet

- Standard Specifications
 - 12 Division → **28 Divisions**
 - 87 Specifications → **170 Specifications**
- Standard Details
 - 11 Divisions → **13 Divisions**
 - 269 Details → **400+ Details**
- 852 Pages → **Estimated > 1,500 Pages**

Rule 2: Make Contracting Easier

Old Contracting Method

30+ Days

Identify Need

Develop RFP

Solicit Proposals

Make Consultant Selection

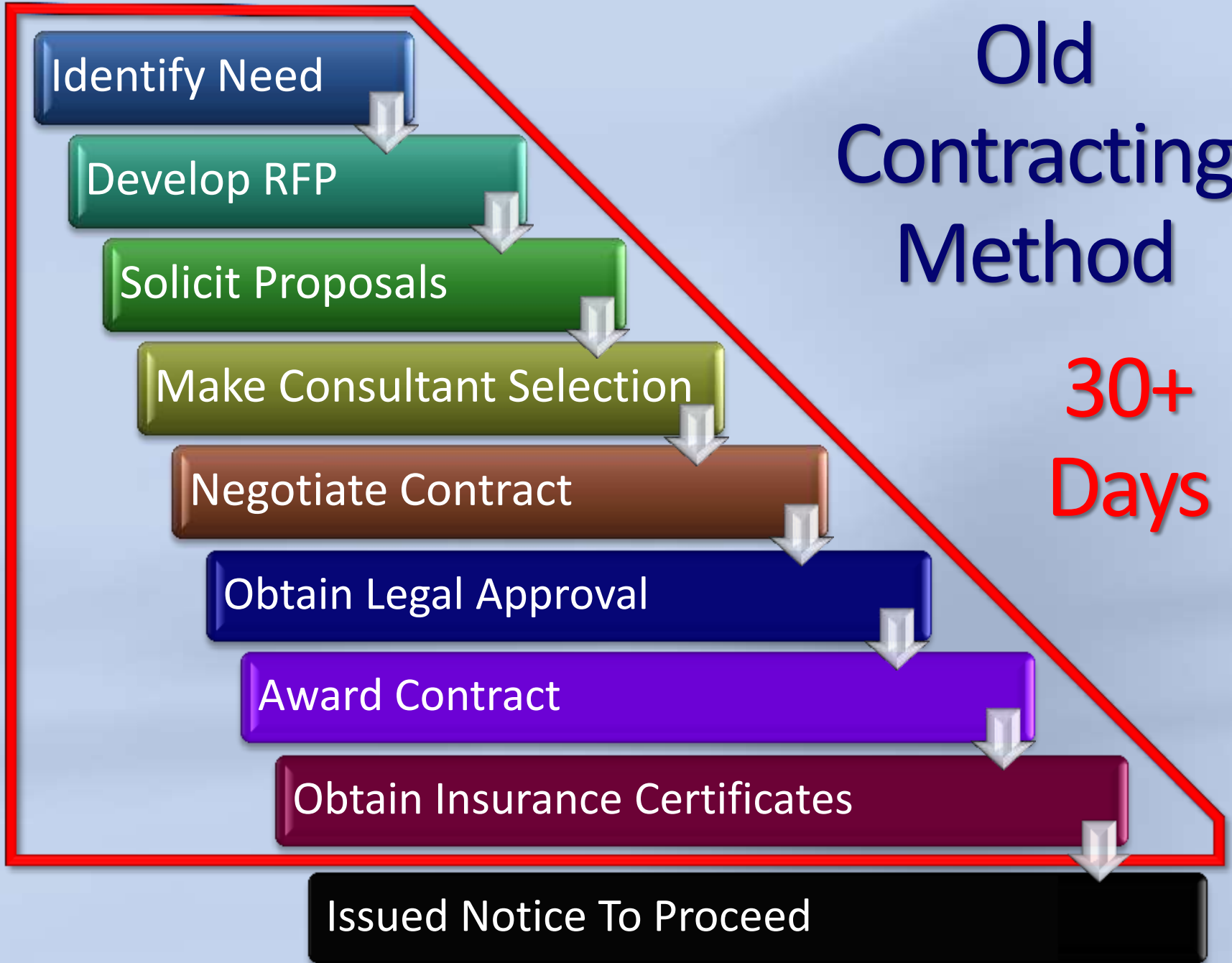
Negotiate Contract

Obtain Legal Approval

Award Contract

Obtain Insurance Certificates

Issued Notice To Proceed



General Engineering Services (“On-Call”)

Up Front Work

- Selection By Category
 - \$ Contracts Approved
 - Insurance Certificates on File
 - Pre-Negotiated Rates & Markups
- 

Identify Need By Category

Negotiate Task Order

- Scope
- Schedule
- Budget
- Project Management Plan

2007-2011 Task Order Summary

● Amount Paid on GES Task Orders:	\$12,135,536
● Number of GES Task Orders Written:	<u>380</u>
● Average Price of GES Task Order:	\$ 31,936
● Total Construction Mngt Task Orders:	\$2,445,498
● Number of CM Task Orders Written:	<u>26</u>
● Average Price of CM Task Order:	\$ 94,058

2012 RFP Technical Disciplines

- Aerial Mapping
- Architectural Services
- Business Consulting
- Cathodic Protection
- Dam Engineering Services
- Drainage & Flood Plain Services
- Drafting Services
- Electrical, Power, and Lighting Systems
- Estimating Services
- Geotechnical Services
- Heating, Ventilating and Air Conditioning Systems
- Instrumentation and Controls
- Security Services (O&M)
- Structural Engineering Services
- Survey Services
- Water Transmission and Distribution Systems
- Water Treatment Processes

2012 RFP Construction Disciplines

- Construction Administration Functions
- Dam Construction
- General Building
- Electrical and Instrumentation & Controls
- Hydroelectric Power
- Heating, Ventilating, and Air Conditioning (HVAC) and Plumbing Systems
- Specialty Inspection
- Water Transmission and Distribution
- Water Treatment

2012 RFP Planning Disciplines

- Demand Planning
- Environmental Planning
- Raw Water Supply
- Treated Water Planning
- Water Resource Planning
- Water Resources Analysis
- Water Rights

Total: 33 Disciplines!

Rule 3:

Agree On & Document Processes,
Eliminate Wasted Steps & Educate

[WATER SERVICE
& SUPPORT](#)[BILLING
& RATES](#)[CONSERVATION](#)[WATER
QUALITY](#)[SUPPLY &
PLANNING](#)[RECREATION](#)[CONSTRUCTION
PROJECTS](#)[EDUCATION
& OUTREACH](#)[ABOUT US](#)

Doing Business with Us

[Requests for Bids](#)

Engineering Overview

[Engineering Standards](#)[Capital Projects Procedure
Manual](#)[Dam Safety](#)[Purchasing Overview](#)[Small Minority and Women Business
Enterprise Program](#)[GIS Maps and Data Requests](#)[Restricted Access Area](#)[Plan Reviews](#)[Backflow Prevention Program](#)[Operating Rules](#)[Water Sales Forms](#)[Home](#) [»](#) [Doing Business with Us](#) [»](#) [Engineering Overview](#) [»](#) [Capital Projects Procedure Manual](#)

Capital Projects Procedures Manual

Disclaimer

This Web site is provided as a public service with no claim as to the accuracy of its content. Nothing contained herein creates, modifies, or supplants Denver Water's rules or regulations, including but not limited to Engineering Standards, Operating Rules, Personnel Policies, and this Capital Project Procedures Manual, nor does use of this Web site create or modify any legal relationship with Denver Water. This Web site is provided "AS IS" and Denver Water makes no warranty, express or implied, and assumes no legal liability or responsibility for the ability of users to fulfill their intended purposes in accessing or using this Web site or for errors or omissions in its content. Use of this Web site is at your own risk. In providing this Web site or access to it, Denver Water assumes no obligation to assist in its use or in the development, use, or maintenance of any applications applied to or associated with it.

Logging On

Selecting the Continue button below will open a new browser window displaying the Capital Projects Procedures Manual logon page.

Please enter "guest" for the username and select the **Log On** button. No password is needed.

[Continue](#)

Capital Project Procedures Manual

- **Project Initiation**
- **Design Initiation**
- **Project Bidding and Award**
- **Preconstruction**
- **Construction Administration**
- **Contract Completion**
- All Sections: Forms, Workflow Graphics, Reference Materials

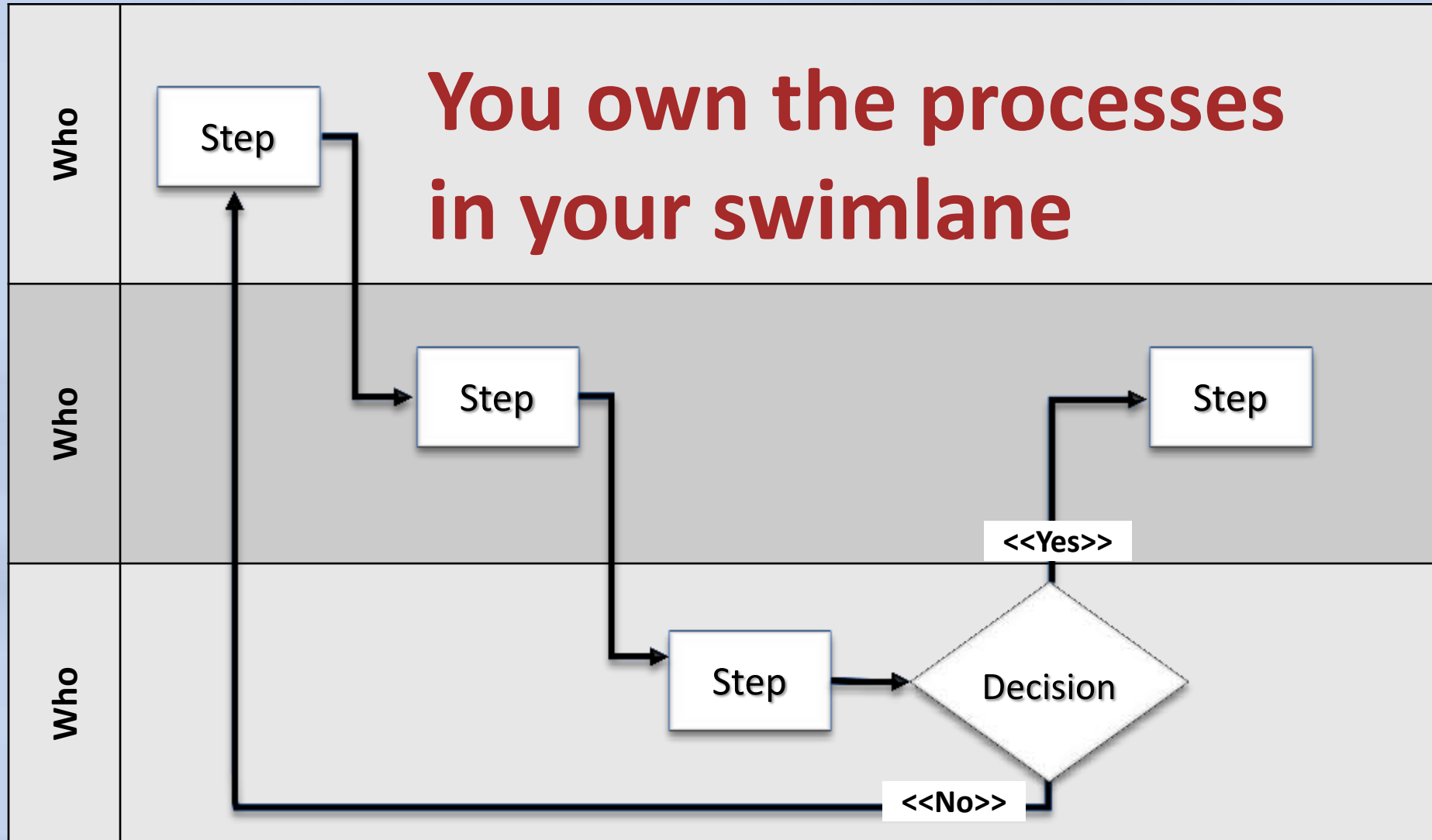
Follows PMI Concepts

Drive Home Concepts: Training

Introduction to Project Procedures	Trust/Personal Styles
Project Initiation	Change & Meeting Management
Scope Development/Risk	Negotiations
Work Planning	Closeout
Design Management	Ethical Decision Making

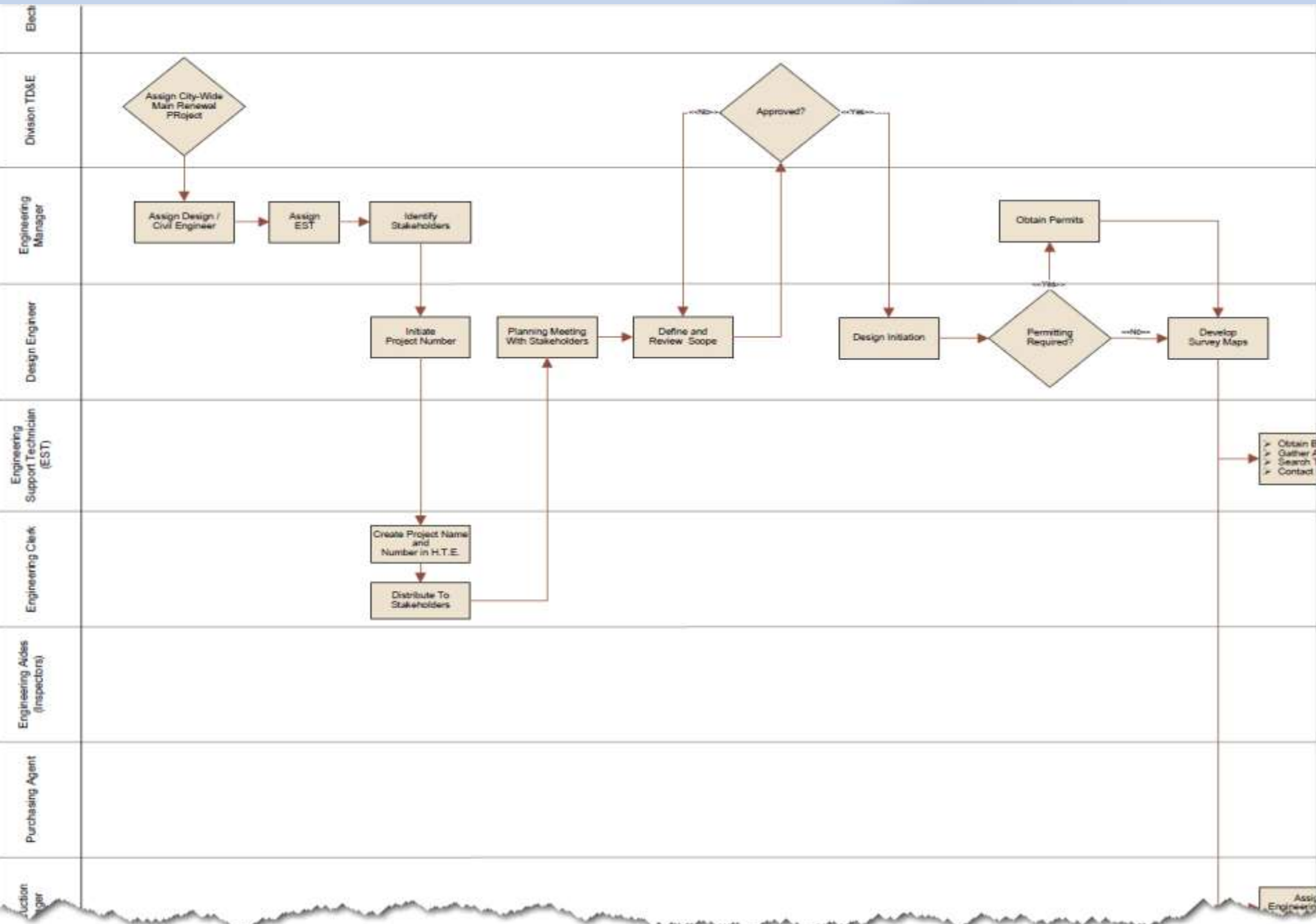
10 Modules: 30 Hours

Streamlining Processes: Workflows With Swimlanes



Real-Life Example

Pueblo Water Workflow: Project Preconstruction



Rule 4:

Carry Efficiencies To The Field

Standard Work: Field Trucks (using the LEAN process)

Step 1: Reason For Action

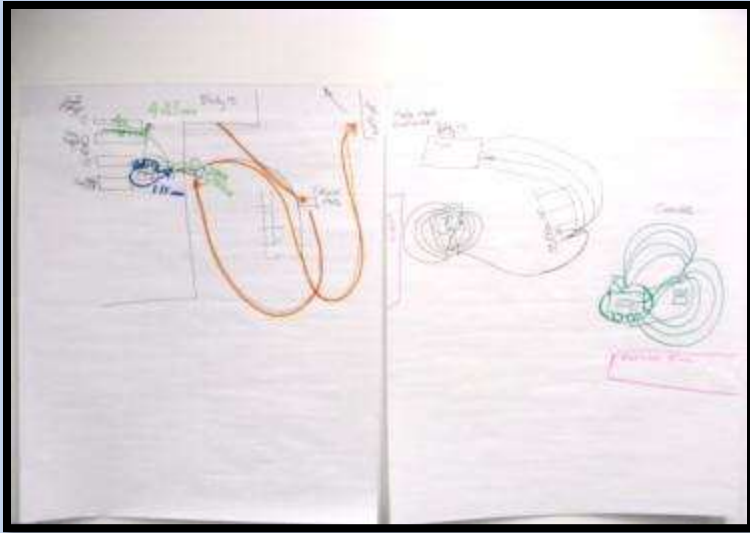
Problem Statement:

- lost time due to the need to move tools and inventory
- non-standard vehicles limit flexibility, cause uneven wear and tear on vehicles, and prevents from having the right number of vehicles.

AIM: Standardize the equipment, tools, and layout of trucks

Scope: Review stock of items carried on field service vehicles. Develop standard vehicle layout.

Step 2: Current State

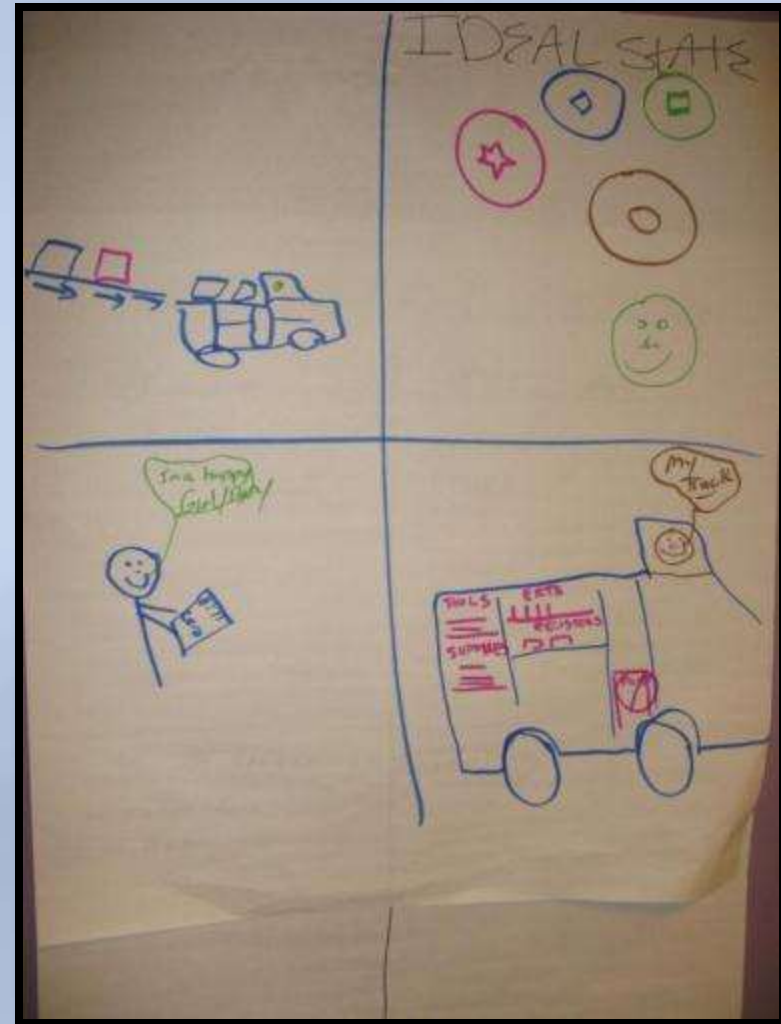


- All vehicles stocked/organized differently
- Waiting time at warehouse
- Time lost searching for items
- Extra weight on vehicles
- Registers identical and can be installed incorrectly



Step 3: Ideal State

- Truck stocked overnight
- Truck is fueled and ready to go in morning
- ERT registers are unique and don't work in the wrong size meter
- Customers are happy (bills are zero)
- Field Techs are happy in their neatly organized trucks.



Step 4: Target State

- Minimized warehouse time
- Ideal use of space
 - Organized
 - Labeled
 - Optimized inventory
- Fully outfitted spare
- More standardization



Step 5: Gap Analysis

Problem	Root Cause
Time waiting at warehouse for supplies	Non standard orders (ordering individual items rather than cases)
Significant variation of inventory between Field Service Trucks	No standard inventory list
Difficult to find items (especially when using another's truck)	Lack of organization/standardization
Time to assess inventory needs and restock truck	Lack of organization/No standard inventory list
Time lost on jobs/safety hazards	Inadequate equipment (flashlights, snow brush, rear handles, heavy pumps)



Step 6: Solutions

If We...	Then We...
Create a standard inventory for Field Service Trucks	Will know how much inventory is on each truck and be able to stock trucks quicker
Order from the warehouse in standard amounts	Can cut down time waiting at the warehouse
Clean and organize Field Service Trucks	Expect that Field Techs can locate tools and items faster
Standardize and organize tools and inventory on CS Field Trucks	Will be able to rotate trucks for maintenance
Create a standard inventory based on data	Reduce trips to the warehouse and total inventory on trucks

Step 7: Experiments

Item	Expected Results	Actual Results
1. Create Standard Inventory	Reduce time searching for tools and materials	Own Truck -7% Different Truck -48% Supervisor -63%
2. Organize Truck (6s)	Reduce time searching for tools and materials	Own Truck -7% Different Truck -48% Supervisor -63%
3. Install Handles on Back of Truck	Improved Safety and Ergonomics	Improved Safety & Ergonomics
4. Enhance Tread on Rear Bumper	Improved Safety and Ergonomics	Improved Safety & Ergonomics
5. Standardize Inventory, Tools, & Supplies	Reduce Time, Improve Safety	Improved Time, see above
6. Standardize Warehouse Order Quantities	Reduce Warehouse Time	Non-standard order fulfillment reduced from 4:45 to 1:52 (60%)
7. Install shovel, tool, and hand pump loops	Reduce time, improve safety	Time to identify missing tool reduced 80%

Step 8: Results / Lessons Learned

Item	Initial	RIE	30/60/90
Reduced Tool Purchases		\$75,344	
Reduced Truck Inventory		\$ 5,100	
6s Score (Organization)		0.83	
Safety Improvements		8	

**Resulted in highly motivated,
positive employees**

Close: Rules For Standard Work

1. Eliminate redundant activities
2. Make contracting easier
3. Agree on and document processes, eliminate wasted steps, and educate
4. Carry efficiencies to the field

Thanks for listening!

Questions?